Reg. No.															

Question Paper Code	13297

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Civil Engineering

20CEPC503 - DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURE

Regulations - 2020

(Use of IS456-2000, Code of Practice for Reinforced Cement Concrete and IS456-1978 Design Aids for Reinforced Cement Concrete is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	What is Load Factor? (a) Ratio of working load to ultimate load (b) Product of working load and ultimate load (c) Product of working load and factor of safety (d) Ratio of ultimate load to working load	*1*	*K1*	*CO1*
2.	What is serviceability? (a) It refers to condition when structure is not usable (b) It refers to services offered in the structure (c) It means that the structure should perform satisfactorily under different loads, without discomfort to user (d) It means that structure should be economically viable	*1*	*K1*	*CO1*
3.	Spacing of stirrups in a rectangular beam, is (a) Kept constant throughout the length (b) Decreased towards the centre of the beam (c) Increased at the ends (d) Increased at the centre of the beam	*1*	*K1*	*CO1*
4.	The maximum depth of neutral axis for a beam with Fe 415 bars in limit state method of design (a) 0.46 d (b) 0.48 d (c) 0.50 d (d) 0.53 d	*1*	*K2*	*CO2*
5.	For control of deflection, which of the following does not affect the span to depth ratios as given in code (a) Span of the element (b) Compression reinforcement (c) Tension reinforcement (d) None of the mentioned	*1*	*K2*	*CO2*
6.	A T-beam behaves as a rectangular beam of a width equal to its flange if its neutral axis (a) Falls within flange (b) Falls below flange (c) Coincides with the geometrical center of beam (d) Falls below the centroid axis of the beam	*1*	*K2*	*CO2*
7.	An RCC beam can have maximum tension reinforcement as: (a) 6% bD (b) 2% bD (c) 3% bD (d) 4% bD	*1*	*K1*	*CO3*
8.	Torsion resisting capacity of a given RC section (a) decreases with decrease in stirrup spacing (b) decreases with increase in longitudinal bars (c) does not depend upon stirrup and longitudinal steels (d) increases with the increase in stirrup and longitudinal steels	*1*	*K2*	*CO3*
9.	For the steel grade Fe415, the maximum tensile strain permitted in limit state method as per IS456:2000 is (a) 0.0020 (b) 0.0028 (c) 0.0030 (d) 0.0038	*1*	*K1*	*CO3*

10.	The amount of reinforcement for main bars in a slab, is based upon (a) Minimum bending moment (b) Maximum bending moment (c) Maximum shear force (d) Minimum shear force	*1*	*K1*	*CO4*
11.	Distribution reinforcement in a simply supported slab, is provided to distribute (a) Load (b) Temperature stress (c) Shrinkage (d) All of the mentioned	*1*	*K1*	*CO4*
12.	In a one-way slab load is distributed over (a) Shorter Side (b) Longer Side (c) Both Side (d) None of the mentioned	*1*	*K2*	*CO4*
13.	For a longitudinal reinforcing bar in a column, the cover should not be less than (a) 10 mm (b) 20 mm (c) 30 mm (d) 40 mm	*1*	*K2*	*CO5*
14.	The diameter of longitudinal bars in a column should not be less than (a) 4 mm (b) 8 mm (c) 12 mm (d) 16 mm	*1*	*K1*	*CO5*
15.	A column is a structural member designed primarily to take (a) Torsional load (b) Tensile load (c) Compressive load (d) Shear	*1*	*K2*	*CO5*
16.	The strength of column does not depend on (a) Width of building (b) Material of column (c) Cross sectional configuration (d) Length of column	*1*	*K1*	*CO5*
17.	A spread footing for a single column is known as the _____ (a) Isolated footing (b) Combine footing (c) Strip footing (d) Eccentric footing	*1*	*K2*	*CO6*
18.	A combined footing is provided when the (a) bearing capacity of soil is less (b) end column is near a property line (c) columns are very near to each other so that their footing overlap (d) all of the mentioned	*1*	*K1*	*CO6*
19.	When a footing fails due to insufficient bearing capacity, distinct failure patterns are developed depending upon _____ (a) Failure mechanism (b) Plastic equilibrium (c) Shear strength (d) All of the mentioned	*1*	*K2*	*CO6*
20.	If the width of the foundation for two equal columns is restricted, the shape of the footing generally adopted, is (a) Square (b) Rectangular (c) Trapezoidal (d) Triangular	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	What is meant by Modular ratio?	*2*	*K1*	*CO1*
22.	List the advantages of Limit State Design.	*2*	*K1*	*CO1*
23.	Compare between under reinforced and over reinforced section.	*2*	*K2*	*CO2*
24.	Illustrate any two advantages of flanged beams.	*2*	*K2*	*CO2*
25.	Interpret the expression for minimum shear reinforcement.	*2*	*K2*	*CO3*
26.	Interpret the condition in which the torsion reinforcement is provided in beam.	*2*	*K2*	*CO3*
27.	Outline the middle and edge strip of a two way slab.	*2*	*K2*	*CO4*
28.	Illustrate any two general features of two way slab.	*2*	*K2*	*CO4*
29.	Compare between short column & long column with respect to its structural behavior.	*2*	*K2*	*CO5*
30.	Define safe bearing capacity.	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	A reinforced concrete beam is supported on two walls 750mm thick, spaced at a clear distance of 6m. The beam carries a super imposed load of 9.8kN/m. design the beam using M20 grade concrete and Fe415 grade steel.	*10*	*K3*	*CO1*

OR

	b)	Calculate the amount of reinforcement required in a beam of a rectangular section of width 300mm and effective depth 500mm to resist a factored moment of 300kN-m. Use M20 & Fe415 steel.	*10*	*K3*	*CO1*
32.	a)	Find the moment of resistance of T beam having following data 1. b_f=740mm 2. d=400mm 3. b_w=240mm 4. A_{st}=5 no of 20mm dia Fe415 bars 5. D_f=100mm M20 grade concrete	*10*	*K3*	*CO2*
		OR			
	b)	Find the moment of resistance of T beam having following data 1. b_f=700mm 2. d=600mm 3. b_w=240mm 4. A_{st}=5 no of 25mm dia Fe415 bars 5. D_f=90mm M20 grade concrete	*10*	*K3*	*CO2*
33.	a)	Design a beam of 250mm wide and 500mm overall depth subjected to ultimate bending moment of 40kN-m, shearforce of 40kN, Torsional moment=30kN-m. Adopt effective cover of 50mm on top &bottom. Use M20 & Fe415steel.	*10*	*K3*	*CO3*
		OR			
	b)	A RC beam of 250mm wide & 550mm deep is reinforced with 4bars of 25mm diameter. Effective cover is 50mm. It is provided with 2-legged 8mm diameter stirrups at a spacing of150mm. Determine the strength of the section. If the two bars are bent up at 45 degree at a section. What is the shear strength of the section in beam? Use M20 & Fe415 steel.	*10*	*K3*	*CO3*
34.	a)	Design a Two way slab for an office floor to suite the following data: Live load = 4 kN/sq.m, Load due to finishes = 1.5 kN/sq.m, Size of floor = 4 m X 6 m, Edge conditions: Two adjacent edges discontinuous. Use M20 & Fe415 steel.	*10*	*K3*	*CO4*
		OR			
	b)	Design a one way slab for the following data: Size = 3 m x 9 m, width of the support = 230 mm, live load = 3 kN/Sq.m, floor finish = 1 kN/Sq.m. Use M20 & Fe415 steel.	*10*	*K3*	*CO4*
35.	a)	Design a axially loaded tied column 400 mm x 400 mm pinned at both ends with an unsupported length of 3 m carry a factored load of 2300 kN. Use M20 & Fe415 steel.	*10*	*K3*	*CO5*
		OR			
	b)	Design a uniaxially eccentrically loaded braced rectangular column for the following data. Ultimate axial load = 1200 kN, Ultimate moment in long direction = 280 kN-m, Unsupported length of the column = 3.4 m, Effective length in the long direction = 3.2 m, effective length in the short direction = 2.8 m, Column section = 360 mm x 540 mm. Use M20 & Fe415 steel.	*10*	*K3*	*CO5*
36.	a)	A rectangular RCC column size 300 mm x 450 mm carrying an axial load of 1500 kN. If the safe bearing capacity of the soil is 120 kn/ sq.m. Design a suitable footing. Consider M25 & fe415 grade steel.	*10*	*K3*	*CO6*
		OR			

b) Design a combined footing for two columns A & B, carrying loads of 500 kN and 700 kN respectively. Column A is 300 mm x 300 mm in size and column B is 400 mm x 400 mmin size. The centre to centre spacing of the column is 3.4 m. The SBC of the soil is 150 kN/Sq.m. Use M20 & Fe415 steel. *10 K3 CO6*